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TECHNICAL REPORT

Comparison of the Air Quality Analyses
Done for the BLM Uinta Basin Synfuel EIS
and the BLM Prototype Oil Shale EIS

By
Scott F. Archer
Air Resource Specialist
Colorado State Office
Bureau of Land Management

and

William W. Wagner
and
Mark Green
Air Resource Specialists
Utah State Office
Bureau of Land Management

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Uinta Basin Synfuel EIS and the BLM Prototype Oil Shale EIS

1. Introduction

The BLM is presently developing several Environmental Impact Statements which address synfuel development, primarily in Utah and Colorado. Each EIS has different objectives and purposes and has applied different approaches in the air quality analysis. This comparison study addresses only the Final Uinta Basin Synfuel EIS (UBS) and the Final Supplemental EIS for the Prototype Oil Shale Leasing Program (Prototype). Other synfuel EIS documents are in draft stages with potential changes occurring between the draft and final.

The Uinta Basin Synfuel EIS addressed potential air quality impacts of nine Uinta Basin development proposals on a site specific and regional basis at two production levels. Five developments were specific in nature with more detailed development plans, definition of process mechanics, control technology, and emission values.

The Prototype EIS addressed two hypothetical development technologies on two proposed lease tracts in the Piceance Basin of Colorado. Potential impacts were addressed on a regional basis only, in three production-level scenarios and assumed a "worst case" set of conditions due to a lack of more specific data. Modeling results were reported for only the high level scenario.

These two EIS's, although for different programs, were developed in approximately the same time frame. Public comment on the two draft EIS's expressed concern regarding differences in the air quality impact results and the need to resolve what appeared to be discrepancies between the two studies. Since additional analyses were performed for each EIS between the draft and final versions, this comparison addresses differences and similarities in the air quality results shown in the final documents.

The modeling approaches used in the air quality analyses of the UBS and Prototype were, in part, dictated by the hypothetical nature of the input data. The two approaches differed in the assumed production level scenarios, facilities considered, development time frames, emission source terms, and meteorological assumptions applied. The UBS analysis assumed 23 point source facilities, a synfuel production level of 1,060,000 bbpsd, a regional area of 268 x 180 kilometers, and application of interpolated meteorology from monitored data. The Prototype analysis assumed 17 point source facilities, a synfuel production level of 788,000 bbpsd, a regional area of 230 x 225 kilometers, and assumed, hypothetical meteorology.

A review of Tables 1 and 2 will show that the set of conditions most common to both analyses appropriate for comparison is limited to the regional cumulative impact analysis of primary sources in the high production scenario for a 24-hour period. A broader comparison is not appropriate because of differences in the basic criteria applied to meet the different purposes of the two impact analyses.

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Table 1

Comparison of the Assumed Production Level Scenarios, Pollutants Analyzed, and Modeling Area Scale used in the UBS and Prototype EIS's

		UBS	Prototype
<u>Synfuel Production Level (bbpsd x 1000)</u>			
Colorado	- High level	639	579
	- Moderate level	---	319
	- Low level	271	83
Utah	- High level	321	209
	- Moderate level	---	87
	- Low level	121	25
Total	- High level	1,060*	788
	- Moderate level	---	406
	- Low level	492*	108
<u>Pollutants and level of analysis</u>			
Sulfur Dioxide	quantitative		quantitative
Total Suspended Particulates	quantitative		quantitative
Oxides of Nitrogen	quantitative		quantitative
Ozone	quantitative		by reference
Hydrocarbons	quantitative		by reference
Visibility	qualitative & quantitative		qualitative
Acid Deposition	quantitative		quantitative
Other Pollutants	qualitative		by reference
<u>Modeling Area Scale</u>			
Near Source	Yes		No
Subregional	Yes		No
Regional	Yes		Yes
(Grid scale)	(268 x 180 kilometers)		(230 x 225 kilometers)

* Includes 100,000 bbpsd from White River Oil Shale which was not one of the "proposed actions" but considered an additional primary source.

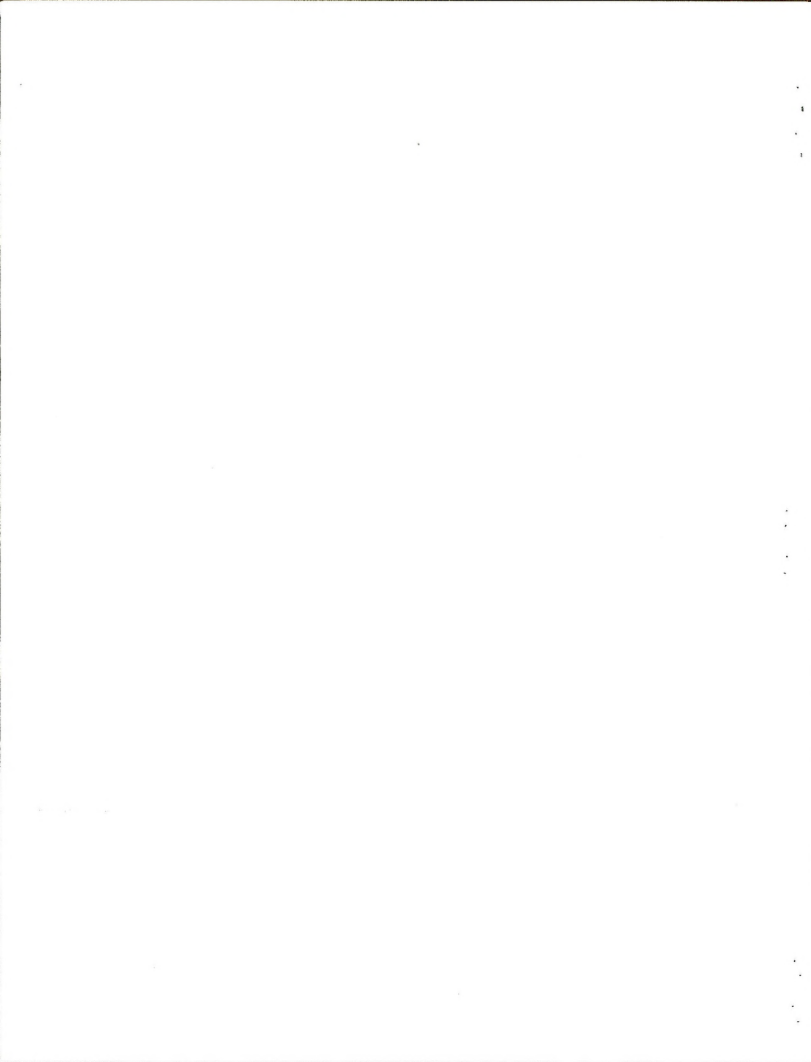


Table 2

Comparison of the Atmospheric Dispersion Models Applied,
Meteorology Assumed, and Averaging Periods Analyzed

UBS		Prototype
<u>Models Applied</u>		
Complex I		Topographic Air Pollution Analysis System (TAPAS)
Complex Terrain Wind Model (CTWM)		Estimating Air Flow Patterns over Complex Terrain (WINDS)
Gaussian Puff Model (GPM)		Complex Interaction with Terrain-PUFF (CITPUFF)
Regional Transport Model (RTM)		Empirical Model for TSP area sources
Empirical Model for TSP area sources		EKMA (By reference)
Empirical Kinetic Model Approach (EKMA)		Visibility Screen (EPA Workbook) level I
Visibility screen (EPA Workbook)		
level I & II		
Plume Visibility Model (PLUVUE)		
<u>Meteorology</u> (Regional Scale)		
Wind Velocity	For GPM Variable wind speed and direction calculated from one year of monitored upper air data from Denver and Grand Junction, Colorado; Lander, Wyoming, Salt Lake City, Utah, vector averaged and input to the CTWM. Low level wind flows were characterized from measure- ments made at U-a, U-b, C-b, Grand Junction and Craig, Colorado.	For TAPAS Constant assumed windspeed and direction, (4 meters per second, west-southwest influencing wind) input to WINDS.
Stability	Pasquill Class D (neutral)	Pasquill Class E (stable)
<u>Averaging Periods</u> <u>Analyzed</u>		
3-hour	Yes	No
24-hour	Yes	Yes
Annual	Yes	No

2. Comparison of Scenarios

As shown in Tables 1 and 3, the high production level scenario assumed in the UBS analysis ($1,060 \times 10^3$ bbpsd) was 34 percent greater than the Prototype analysis (788×10^3 bbpsd). Fewer Utah sources were considered in the Prototype analysis. Five Utah synfuel projects (Enercor-Mono Power, Geokinetics, Magic Circle, Sohio, Tosco) included in the UBS analysis fell outside of the Prototype analysis area. All other Utah project scenarios were identical in the two analyses.

The Prototype analysis also examined fewer Colorado synfuel sources. Four proposed Colorado projects included in the UBS analysis (Exxon, Getty, Multi-mineral, Naval Oil Shale) were not analyzed in the Prototype analysis. Two new "Prototype" leases were included in the Prototype EIS, however, which were not in the UBS analysis. Additionally, when compared to the UBS analysis, the Prototype analysis assumed higher production levels for two projects (Colony, Rio Blanco) and a lower production level for one project (Cathedral Bluffs). Overall, the total assumed Colorado synfuel production level was 10 percent higher for the UBS analysis than for the Prototype analysis.

Differences in the proposed developments and production levels assumed reflect the information available when each study was begun and subsequent status changes in the proposed synfuel developments.

3. Comparison of Modeling Approaches

As described in the Introduction, the level of available detailed information dictated, in part, the scope of air quality modeling applied for each analysis. The UBS EIS examined the potential environmental impacts from several specific synfuel operations and alternative development levels. The proposed action of the Prototype EIS was less well defined however, considering potential leasing of up to two additional "prototype" oil shale tracts for development by unknown companies with assumed technologies.

Table 2 compares the modeling approach and meteorological assumptions applied. Although the same pollutants were addressed in both studies, lack of detail dictated a more limited, "worst-case" analysis for the Prototype EIS.

A major difference in the modeling approaches involved the meteorological conditions assumed. The UBS analysis assembled one year of linearly interpolated hourly upper wind data from four Weather Service stations as well as surface wind data from four locations to characterize surface flow. This data set was input to the Complex Terrain Wind Model (CTWM) which was used to drive the Gaussian Puff Model (GPM) in 3-hour time steps for the regional scale analysis. The GPM results were then summarized and presented as isopleth lines of non-simultaneous maximum concentrations. That is, the lines connected the highest concentrations calculated for the 24-hour averaging time regardless of the time of year they occurred. The isopleth maps are therefore not representative of one point in time but rather lines of highest calculated concentration irrespective of the time during the year when they occurred.

Table 3
Assumed Production Levels and Emission Rates

Primary Emission Sources	Prod Level (bbpsd)	Uinta Basin Synfuels EIS Emissions (gms/sec)					Prod Level (bbpsd)	Prototype EIS Emissions (gms/sec)				
		SO ₂	TSP	NO _x	THC	CO		SO ₂	TSP	NO _x	THC	CO
Utah Synfuel												
Enercor-Mono Power	50	28	61	31	11	9	-	-	-	-	-	-
-Rainbow TS	5	3	4	3	-	-	5	3	4	3	-	-
Geokinetics	70	500	44	207	11	6	-	-	-	-	-	-
Magic Circle	32	41	30	229	1	15	-	-	-	-	-	-
Paraho-Ute	42	51	27	134	4	20	42	50	27	134	-	-
Sohio TS	20	104	179	91	24	8	-	-	-	-	-	-
Syntana	57	36	36	207	23	18	57	36	36	206	-	-
Tosco	45	26	35	218	51	2	-	-	-	-	-	-
Western TS	-	-	-	-	-	-	5	3	6	3	-	-
White River	100	38	55	230	46	106	100	38	55	230	-	-
Utah Other												
Other Planned Projects	-	54	22	28	26	2	-	-	-	-	-	-
Moonlake Power Plant	(800)	53	31	562	0	0	(800)	53	31	281	-	-
Plateau Refinery	-	8	12	16	68	19	-	-	-	-	-	-
Colorado Synfuel												
Cathedral Bluffs	94	236	101	967	12	337	76	153	67	621	-	-
Chevron-Retort	100	187	130	492	200	206	100	101	154	1031	-	-
-Upgrade	-	-	-	-	-	-	-	44	16	183	-	-
Colony	47	36	66	244	44	8	48	40	34	220	-	-
Exxon	47	36	66	244	44	8	-	-	-	-	-	-
Getty	50	93	65	246	100	103	-	-	-	-	-	-
Mobil	50	93	65	246	100	103	50	66	50	194	-	-
Multimineral	50	93	65	246	100	103	-	-	-	-	-	-
Naval Oil Shale	50	14	58	142	3	16	-	-	-	-	-	-
Rio Blanco	86	24	68	201	9	82	100	28	78	233	-	-
Superior-Pacific	-	-	-	-	-	-	15	44	10	22	-	-
-White River	15	44	10	22	9	5	-	-	-	-	-	-
Union	50	93	65	246	100	103	90	120	90	350	-	-
Prototype	-	-	-	-	-	-	100	202	88	816	-	-
Colorado Other												
Craig Power Plant	-	-	-	-	-	-	(1340)	371	90	742	-	-
Hayden Power Plant	-	-	-	-	-	-	(465)	348	23	245	-	-

Note: Values in parentheses not included in Synfuel Production Summary (Table 1).

Given the general nature of the Prototype analysis, this level of effort was not justified, and instead, general, hypothetical "worst-case" meteorological conditions were selected. The "worst-case" set of conditions were chosen to be west-southwest winds at four meters per second and Pasquill E stability.

The most valid comparison between the UBS and Prototype studies would only be those 24-hour periods where west-southwest winds and E stability prevailed in both studies. Because 24-hour periods of west-southwest winds were not specifically summarized within the data-set for the UBS, more general observations were made for this comparison study. The UBS, 24-hour sulfur dioxide and total suspended particulate concentrations were compared with the 24-hour Prototype concentrations for (a) specific locations of concerns including the PSD Class I areas, Colorado Category I areas, and the Class II Uintah-Ouray Indian lands and (b) other PSD Class II areas where isopleths showed elevated concentrations.

Determination of the appropriate emission rates was also necessary. These rates, and the corresponding production values, are summarized by project in Table 3. Differences in total emissions used in both studies are due primarily to the differences in production scenarios assumed. Two other factors did enter in, however. The Colorado Department of Health - Air Pollution Control Division recommended values for five Colorado synfuels projects used in the Prototype analysis which could not be incorporated into the UBS study. The Prototype analysis also incorporated recent changes in the emission rates and locations assumed for the Chevron project which were obtained from Chevron's PSD permit application.

The difference in NO_x emission rates assumed for the Moonlake Power Plant represents an error in the Prototype analysis. As a result, the range of potential "worst case" impacts to Dinosaur National Monument for 24-hour NO_x concentrations should be 15-36, rather than 12-28 as reported. This difference is not believed to be significant.

4. Comparison of Results

As described previously, the only valid comparison which may be made between the UBS and Prototype Air Quality impact analyses is the regional, cumulative, primary source, 24-hour SO_2/TSP ground level concentration values and predicted acid deposition rates. Due to the variation in modeling approaches and assumptions, close quantitative agreement between the studies should not be expected. The UBS analysis, with varying wind flows and the Prototype analysis, with persistent southwesterly wind flow do show similar general areas within the region where elevated ground-level concentrations could occur as shown in Table 4. The area impacted northeast of Craig, Colorado, was outside the region analyzed in the UBS EIS. The Uintah/Ouray Indian lands were outside of the region analyzed in the Prototype EIS.

Examination of the quantitative values resulting from the two analyses (Table 5) shows fairly good agreement for the Class I and Colorado Category I areas. Wider differences shown in the Class II areas are not unexpected because these are largely the result of local impacts (a short distance from the modeled emitting facility) for which longer range transport modeling results are less

Table 4

General Areas of Elevated Ground Level Concentrations

Area	Uinta Basin Synfuels EIS	Prototype EIS
Near Bonanza, UT	X	X
North of Rifle, CO	X	X
North of Meeker, CO	X	X
Northern Piceance Basin, CO	X	X
West of Meeker, CO	X	X
Northeast of Craig, CO		X
Uintah/Ouray Indian Lands	X	

Table 5
Summary of Air Quality Impact Model Results

Area	Uinta Basin Synfuels EIS						Prototype EIS					
	Concentration (ug/m ³)		Deposition (Kg/ha/yr)		Calculated Lake pH		Concentration (ug/m ³)		Deposition (Kg/ha/yr)		Calculated Lake pH	
	SO ₂	TSP	S	N	Marvine	Wilson	SO ₂	TSP	S	N	Marvine	Wilson
<u>Class I</u>												
Flat Tops Wilderness	1-12	2-19	2	4	8-8	7-6	4-10	5-13	.5-1.4	1.2-3.9	8-8	7-6
<u>Category I</u>												
Dinosaur Natl. Mont.	1-13	4-37	-	-	-	-	2-6	2-5	-	-	-	-
<u>Class II</u>												
Near Rifle, CO	80-120	40-80	-	-	-	-	43-104	143-343	-	-	-	-
Near Bonanza, UT	20-40	40-80	-	-	-	-	3-7	63-151	-	-	-	-
North of Meeker	4-8	100-200	-	-	-	-	5-11	5-11	-	-	-	-
Northern Piceance	40-80	120-200	-	-	-	-	0-1	12-30	-	-	-	-
West of Meeker	8-12	10-20	-	-	-	-	0-1	9-21	-	-	-	-
Northeast of Craig	Off grid						8-20	2-5	-	-	-	-

reliable and because the studies utilized different facility development assumptions. These variations become less significant on a longer range transport basis. The Class II area values in Table 5 were determined by comparing the isopleth values from the Prototype analysis (Final EIS pages 115 and 116) with the concentration isopleths from corresponding locations from the UBS Air Quality Report pages 5-84 and 5-86.

An air quality impact analysis must be judged on its own merits, whether it be an analysis for an EIS or permit application, and whether it addresses a hypothetical facility or a detailed development proposal. Due to the nature of the UBS and Prototype analyses, exact quantitative agreement between these studies should not be expected. In general, modeling approaches used in both individual analyses demonstrated:

- a. Similar areas of potential elevated ground level concentrations within the PSD Class II regions.
- b. Potential significant impacts to the PSD Class I Flat Tops Wilderness and the Colorado Category I limitations at Dinosaur National Monument.

For further information contact Scott Archer at the Colorado State Office of BLM or William Wagner at the Utah State Office of BLM.

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